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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/492,246	01/27/00	TONKOVICH	A E-1666B CIP

EXAMINER	
STRICKLAND, I	
ART UNIT	PAPER NUMBER
1754	8

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/492,246	Applicant(s) TONKOVICH ET AL.	
	Examiner Jonas N Strickland	Art Unit 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) *2-4 and 10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-9,11 and 12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4 and 6* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I in Paper No. 7 is acknowledged.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 5, 7-9, and 11-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 7, and 11 recites the limitation "the contact time" in line 13, line 10, and line 15, respectively. There is insufficient antecedent basis for this limitation in the claim.

Claim 1 recites the limitation "the pressure drop" in line 15. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as obvious over Subramaniam et al. (US Patent 5,725,756).

Applicant claims a process for the catalytic conversion of at least one reactant in a thermal chemical reaction, excluding deep oxidation comprising: passing at least one reactant into at least one reaction chamber comprising a catalyst that catalyzes the reaction of said at least one reactant; transferring heat to or from the reaction chamber into at least one heat exchanger; and obtaining a reaction product from the reaction chamber, wherein the step of transferring heat, at steady state, transfers at least 0.6 W/cc of the total reactor volume, wherein the contact time of the reactant with the catalyst is less that about 0.3 seconds.

Subramaniam et al discloses a method to minimize catalyst deactivation rate and coke laydown, and maximize desired reaction rate in processing of industrially significant reactions under supercritical conditions to generate a reaction mixture stream including formed reaction products and reactants. The reaction mixture has fluid density of greater than 0.65 gm/cc (abstract). This method reduces coke buildup in porous catalysts (col. 1, lines 8-11) and is industrially significant in alkylation reactions (col. 1, lines 13-16). Subramaniam et al continues to disclose that a volume of at least 0.65 g/cc maximizes the reaction rates and minimizing deactivation rates and coke laydown rates associated with hydrocarbon contact with acid catalysts (col. 11, lines 16-20; or preferably greater than 0.5 g/cc; col. 11, lines 43-44). With respect to claim 7, Subramaniam et al teaches a porous catalyst having a metal support (col. 23, lines 16-17). Subramaniam et al continues to teach passing the reactor effluent through a heat exchanger (col. 20, lines 50-51).

With respect to the contact time of the reactant with the catalyst being less than 0.3 seconds, Subramaniam et al teaches that a maximized reaction rate is desired in order to improve the catalyst performance (see abstract). Therefore, it would have been obvious to achieve a contact time of less than 0.3 seconds, because the faster the reaction rate, the deactivation of the catalyst decreases, which reduces the formation of undesirable chemical reaction product.

6. Claims 1, 5, 6, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramaniam et al. (US Patent 5,725,756) in view of Baden et al. (US Patent 4,985,230).

Applicant claims a process for the catalytic conversion of at least one reactant in a thermal chemical reaction, excluding deep oxidation comprising: passing at least one reactant into at least one reaction chamber comprising a catalyst that catalyzes the reaction of said at least one reactant; transferring heat to or from the reaction chamber into at least one heat exchanger; and obtaining a reaction product from the reaction chamber, wherein the step of transferring heat, at steady state, transfers at least 0.6 W/cc of the total reactor volume, wherein the contact time of the reactant with the catalyst is less that about 0.3 seconds; and wherein the pressure drop through the reaction chamber is less than about 15 psig.

Subramaniam et al discloses a method to minimize catalyst deactivation rate and coke laydown, and maximize desired reaction rate in processing of industrially significant reactions under supercritical conditions to generate a reaction mixture stream including formed reaction products and reactants. The reaction mixture has fluid

density of greater than 0.65 gm/cc (abstract). This method reduces coke buildup in porous catalysts (col. 1, lines 8-11) and is industrially significant in alkylation reactions (col. 1, lines 13-16). Subramaniam et al continues to disclose that a volume of at least 0.65 g/cc maximizes the reaction rates and minimizing deactivation rates and coke laydown rates associated with hydrocarbon contact with acid catalysts (col. 11, lines 16-20; or preferably greater than 0.5 g/cc; col. 11, lines 43-44). With respect to claim 7, Subramaniam et al teaches a porous catalyst having a metal support (col. 23, lines 16-17). Subramaniam et al continues to teach passing the reactor effluent through a heat exchanger (col. 20, lines 50-51). However, Subramaniam et al does not disclose the pressure drop through the reaction chamber being less than about 15 psig.

Baden et al teaches a method of carrying out heterogeneous catalytic chemical processes, wherein a low-pressure drop and a high heat transfer coefficient represent the desired process conditions. Baden teaches a low-pressure drop will reduce the power required by the process plant irrespective of the type of catalytic process (col. 2, lines 9-13). Baden also teaches that the catalyst temperatures are more easily controlled and excess temperatures resulting in catalyst damage are averted as well as undesired reactions (col. 2, lines 22-25). Baden continues to teach that these reactions are suitable for steam reforming of hydrocarbons.

Therefore, it would have been obvious to one of ordinary skill in the art to modify Subramaniam et al based on the teachings of Baden et al to have a low pressure drop or to have a pressure drop less than 15 psig, which also reads to having a psig of 0 as well as to maintain or control the temperature in order to reduce the formation of

undesirable chemical reaction products in a catalytic chemical process. Such modification would have been obvious to one of ordinary skill in the art, because one would expect the method of reducing undesired reactions in catalytic processes by having a low pressure drop and controlling the temperature as taught by Baden, to be similarly useful and applicable to the teachings of Subramaniam et al, which desires to minimize coke-buildup on catalysts. Furthermore, it is known in the art that coke is an undesirable reaction product in steam reforming reactions as taught by Baden. Furthermore, Baden teaches that a low-pressure drop and temperature control are desired process conditions irrespective of the type of catalytic process.

With respect to the contact time of the reactant with the catalyst being less than 0.3 seconds, Subramaniam et al teaches that a maximized reaction rate is desired in order to improve the catalyst performance (see abstract). Therefore, it would have been obvious to achieve a contact time of less than 0.3 seconds, because the faster the reaction rate, the deactivation of the catalyst decreases, which reduces the formation of undesirable chemical reaction product.

8. Claim 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramaniam et al. (US Patent 5,725,756) in view of Baden et al. (US Patent 4,985,230) and Eri et al. (WO 90/07377).

Applicant claims with respect to claim 8 and 9 wherein the desirable reaction is the water-gas reaction and the desirable products are carbon dioxide and water and the undesirable product is methane. Applicant also claims wherein the desirable reaction is steam reforming of hydrocarbons and the undesirable product is coke.

The teachings of Subramaniam et al. and Baden et al have been discussed. Subramaniam et al teaches reducing coke from catalytic reactions and Baden teaches a process for minimizing the production of undesired products from a steam reforming reaction. However, none of the references teach a water-gas shift reaction.

Eri teaches a water gas shift reaction using catalysts, and producing an undesired side reaction of methane (p. 12, line 36 – p.13, line 26).

Therefore, it would have been obvious to one of ordinary skill in the art to be able to reduce the side reaction of methane based on the teachings of Subramaniam et al. and Baden et al, because Subramaniam et al teaches minimizing undesired reaction products in catalytic reactions and Baden et al teaches that a low pressure drop and maintaining the temperature of a catalytic reactor reduces the formation of undesired reactions, irrespective of the type of catalytic process. Therefore, one would expect that it would be advantageous to employ the combination of Subramaniam et al. and Baden et al with the teachings of Eri, in order to reduce the side reaction of methane in a water gas shift reaction.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Andrews et al. (US Patent 5,364,824)

Wegeng et al. (US Patent 5,811,062)

Drost et al. (US Patent 6,126,723)

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonas N Strickland whose telephone number is 703-306-5692. The examiner can normally be reached on M-TH. 7:30-5:00, off 1st Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 703-308-1164. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9762 for regular communications and 703-872-9762 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1495.

STEVEN P. GRIFFIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Jonas N. Strickland
October 25, 2001